WISDOM IS COMMON SENSE TO AN UNCOMMON DEGREE.

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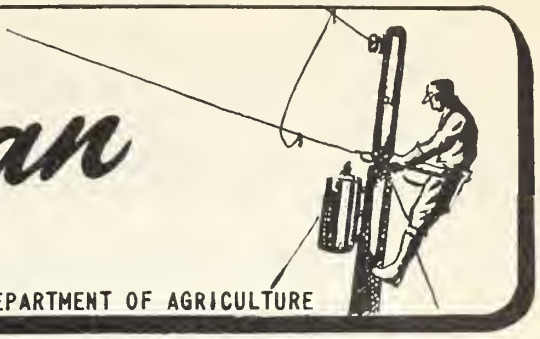
the Lineman

RURAL ELECTRIFICATION ADMINISTRATION - U.S. DEPARTMENT OF AGRICULTURE



POLE-TOP ACCIDENT PROVES FATAL

Co-ops Set Safety Records

Three REA-financed cooperatives, two in Kentucky and one in Minnesota, have rolled up impressive records of man-hours of work performed without one lost-time accident.

Hickman-Fulton Counties Rural Electric Cooperative Corp., Hickman, Ky., Completed four and one-half years without a lost-time accident on December 31, 1947. Total number of man-hours during this period was 152,117. Co-op manager is H. C. Schimmel.

On January 8, 1948, the first major accident in nine years of operation occurred on the lines of the Fox Creek Rural Electric Cooperative Corp., Lawrenceburg, Ky. Roy York is manager.

On November 19, 1947, the Agra Lite Cooperative, Benson, Minn., established a record of 26,574 man-hours worked without a lost-time accident. Co-op manager is Victor Hanson.

The Lineman congratulates Managers Schimmel, York and Hanson, and members of their staffs, for these splendid records.

Meter Schools Helpful

The Iowa Safety and Job Training Program sponsored an electrical meter school at Iowa State University, February 3, 4, 5, and 6. The instruction was divided into two groups, elementary and advanced. The elementary group took up single phase metering and testing. The advanced group worked with poly-phase metering and theroy.

The University of Florida Association, cooperating with the Southeastern Metermans' Association, will sponsor an electrical meter school during the first week in May. A definite location has not been announced but the school will very likely be held at the college in Gainesville. Of primary importance to the cooperatives in Florida and other nearby southeastern states is the announcement of an elementary course for beginners. The beginners course this year will teach how to take

(See 'METERS' Page 2)

A crew of men was installing a voltage regulator and four lighting arresters in a substation.

The first job done was to disconnect the middle phase two spans away from the substation and ground it. The road and field phase were left energized. A lineman climbed the pole on the source side of the substation and removed the oil circuit breaker jumpers from the north and south phase. These jumpers were attached to the down guy. The arresters were to be installed on the east side of the top arm behind the oil circuit breakers. The victim was on the north side of the OCB pole and moved around the pole to the west to get in position to install the arrester on the south end of the arm, In doing so, he passed under the south OCB. He passed his safety strap over the double arm at the top of the pole and fastened it. It is believed that about this time he raised a little too high in his hooks and his shoulder contacted the hot south phase. The contact was momentary.

The victim broke loose and sat upright on top of the south OCB. His belt over the double arms held him in position. He was lowered to the ground and artificial respiration started immediately. It was deemed inadvisable to attempt pole top resuscitation in a position near the energized phase. The victim's pulse was regular and it was decided to take him to the hospital and continue resuscitation on the way. The trip required approximately thirty minutes. The victim had not regained consciousness nor was he breathing without assistance, upon arrival at the hospital. However, the pulse was good and there was every reason to believe that there was a good chance to revive him.

It was several minutes before a doctor was available. Upon the insistance of the nurses, artificial respiration was stopped. There was a lapse of about five minutes before a mechanical respirator was put in operation. The victim did not regain consciousness and was pronounced dead a few hours later.

(Discussion and Diagram, Page 4)

THE LINEMAN

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Well Balanced Management

A business cannot long remain sound which makes no provision for keeping accident rates down. The cost of accidents is a non-productive operating expense. Accident prevention, for that reason, rests squarely on the shoulders of Management. Management will get results in accident prevention in direct proportion to the interest it shows in this activity.

What are Management's concerns? A well balanced management insists on good housekeeping and gets it. It gets lines built and new members signed up. It does a balanced job of supervising the various phases of the business.

Each activity receives its just proportion of attention. It has been said that 'the wheel that squeaks the loudest gets the grease,' so it is understandable that the pressure of new members for service and the drive to get lines built does occupy a large portion of Management's time and energy.

These are probably important reasons why Management tends to favor an organized Safety Program headed by one or more full time men. Such programs provide for accident prevention with a minimum amount of detailed work on the part of Management.

However, these programs still need the active interest and full support of Management. Since electric line work is potentially hazardous it is impossible to teach safety as a separate part of the job. How the job is done most often determines the hazards involved. Safety for the man means teaching him how, why, and when to do what. That is job training and a concern of Management. After this has been accomplished, informational material should be furnished to provide an understanding of the forces with which the worker deals and of the equipment he handles and operates. The Lineman, beginning with this issue, will publish informational material occasionally which should help its readers to acquire a better understanding of the work they are called upon to do. The first article deals with transformers.

(METERS -- from Page 1)

apart, repair, clean, and test a single phase meter. Each man will actually do this job under skilled supervision. Any cooperative in the United States is welcome to send one or more men. The majority attendance, however, is expected from the nearby southeastern states. The April issue of The Lineman will contain full details.

Electric Shock Still Leads As Cause of Fatal Accidents

At the end of the war electrical shock accounted for more than 2/3 of the fatal accidents on REA-financed systems. Tree and clearing accidents ranked second and pole unloading third. For the year 1947, electric shock was first, accounting for 71.9% of the fatal accidents. Transportation ranked second with 12.5% and pole unloading and handling third with 9.4%.

Fatal Accident Percentages 1939 through 1947

Electric Shock	76.0%
Pole Unloading and Handling	8.7%
Transportation	5.6%
Tree and Clearing	4.3%
Physical Condition	1.8%
Explosives	1.2%
Drowning	1.2%
Falls	1.2%

Electric shock still presents the greatest hazard to the lineman. Of particular significance is the effectiveness of artificial respiration. Of the men rendered unconscious by electric shock during 1944 and 1945, only 14.8% were revived. This low percentage was undoubtedly caused by failure to apply artificial respiration at the scene of the accident. During 1946 and 1947, artificial respiration saved 36.2% of the men rendered unconscious by electrical shock. This is almost two and one-half times the percentage revived in the earlier period.

Committee for 1948 Conference Selected

The following Job Training and Safety Supervisors were selected by the 1947 conference to plan the program for the 1948 conference to be held this fall:

Chairman	State
Ed Nauert	Texas
E. C. Edwards	Alabama
E. H. Stovall	Mississippi
W. H. Abel	Nebraska
D. B. Bidle	Illinois

The conference voted that the retiring chairman be held over each year as a member of the next year's committee. D. B. Bidle, chairman of last year's committee, automatically became a member of the new committee.

TRANSFORMER POLARITY

When dealing with direct current, we think of polarity as being positive (-) or negative (-). Since 60-cycle alternating current changes direction at the rate of 120 times per second, each wire in a circuit is positive 60 times each second and negative 60 times each second. For that reason no part of an A. C. circuit can ever be identified as permanently positive (-) or permanently negative (-). Polarity in the A. C. circuit is based on the fact that one part of the circuit is maximum positive at the same instant that another part of the circuit is maximum negative.

Polarity is of no importance to the lineman until he starts to connect to the lines pieces of equipment which have coils and iron cores. The transformer is one example. When transformers are hooked up in parallel, care must be taken to see that proper polarity is observed. Failure to observe proper transformer polarity will result in the transformers and possibly other equipment burning out. Polarity of the terminals of a transformer is determined by the relative directions of the primary and secondary windings to the iron core. In sketch (a) both coils are wound in the same direction. In sketch (b) the coils are wound in opposite directions.

Lead A 1 in figure (1) would be of opposite polarity to lead B 1 in figure (2) yet both leads are in the same relative position for each coil. In this particular instance lead B 2 of figure (2) has the same polarity as lead A 1 of figure 1.

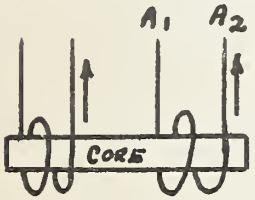


FIG 1

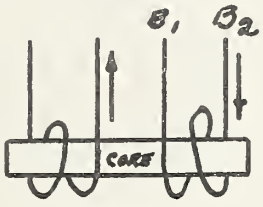


FIG 2

In figure 2 the coils are wound in opposite directions so that the left hand lead (1) of one coil is not the same polarity as the left hand lead B 1 of the second coil. This same condition can be created in Figure 1 by crossing the leads of either of its coils.

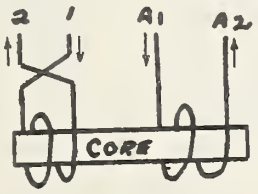
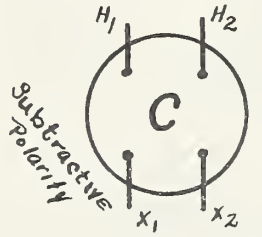
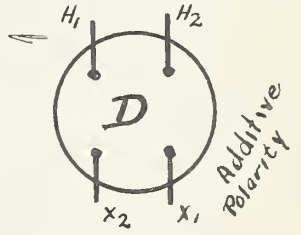


FIG 3

Note that even though the coils are wound in the same direction on the core the left hand lead of one coil (2) is of different polarity than the left hand lead A 1 of the other coil. Trace out the current flow by following the arrows in figures 1, 2, and 3, Since linemen connect up transformers by noting the bushing locations of each transformer, it will be apparent that the polarity of these bushings depend upon which end of the coil is attached to it. It is not uncommon to find that in repairing a transformer the leads have been reversed when connected to the bushings.

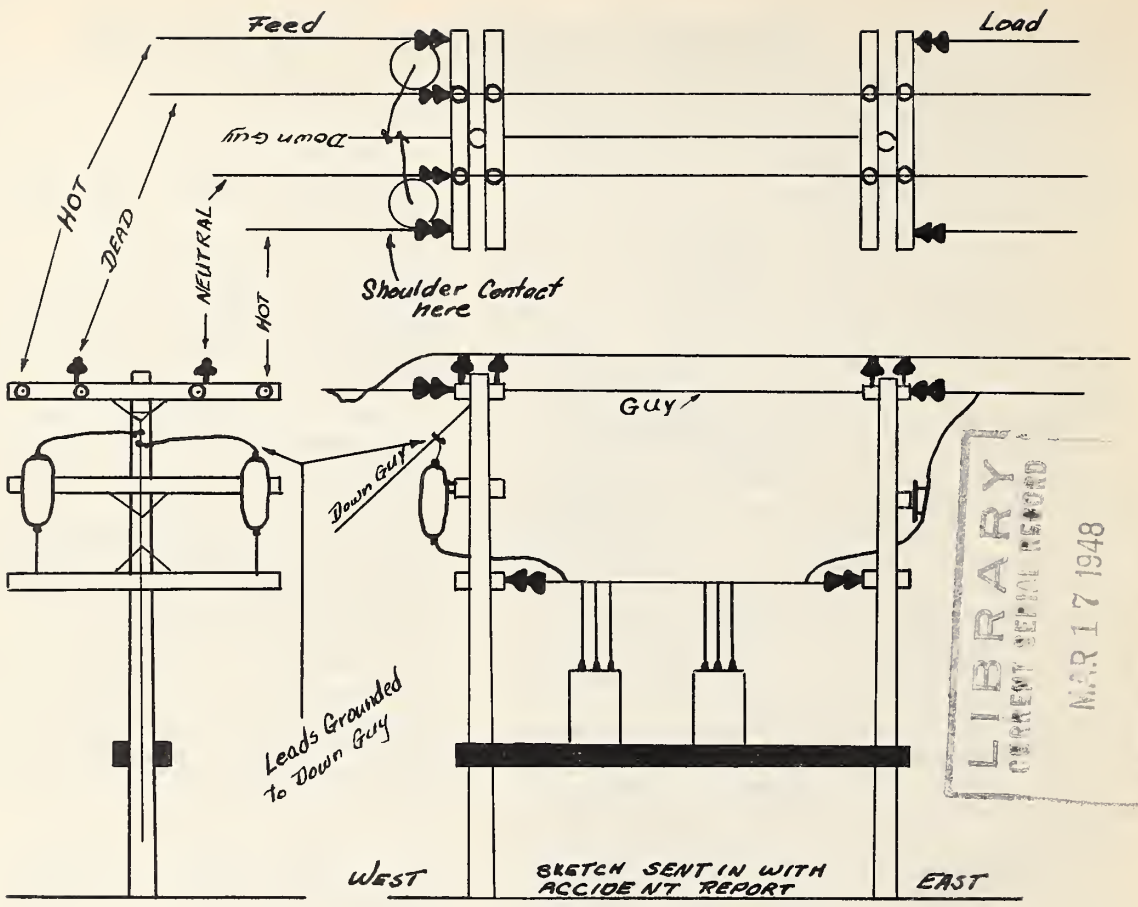
It may be difficult to determine the relative directions of the primary and secondary windings for establishing the polarity of the terminals by looking at the windings. For that reason it is customary to mark the terminals. The primary terminals are marked H 1 and H 2. The secondary terminals are marked X 1 and X 2. Any X 1 terminal has the same polarity as any H 1 terminal. Likewise, any X 2 terminal has the same polarity as any H 2 terminal. The X 1 terminal of one transformer has the same polarity as the X 1 terminal of any other transformer. Likewise, any H 2 terminal has the same polarity as all other H 2 terminals, etc.





If the X 1 and X 2 secondary terminals are directly opposite the H 1 and H 2 primary terminals (Transformer C), the polarity is said to be subtractive. If the H 1 and H 2 primary terminals are diagonally opposite the X 1 and X 2 secondary terminals (Transformer D), the polarity is said to be additive. In a transformer of subtractive polarity the current in the secondary flows in the same direction as the current in the primary (note arrows in sketch). In a transformer of additive polarity the currents in secondary and primary coils flow in opposite directions. The terminals are always labeled, regardless of the position to which they are brought out, so that the current flows in the direction 1 to 2 for both H and X terminals. Distribution transformers under 200 kva and 8660 volts are usually wound to have additive polarity, however this is not a definite rule and they may also have subtractive polarity.

If the H and X polarity marks are not available it will be necessary to run a test and mark the terminals before the transformer is hooked up for parallel operation. Testing for polarity will be covered in another article.



Discussion Points

1. Was the victim in the safest position to install the arrester? Is position an important factor in doing line work safely?

2. Would a position on the east side of the pole have prevented the victim from contacting the conductor? Would it be possible in this position to slip, fall, or inadvertently make any move during the installation which could result in a hot contact?

3. Do insulators ever break down and leak so that it is dangerous to contact the hardware which attaches them to arms and poles?

4. Did leaving the north and south phases hot enable service to be continued to any consumers on the load side?

5. If the north and south phases had been opened at the same point that the middle phase was opened, would it have been safer?

6. Could a foreign line crossing the dead phases on the load (east) side of the substation energize the substation to the bottom of the oil circuit breakers? (The breakers were tripped open before grounding the top leads to the down guy:)

7. Could a member out of service due to de-energizing the load side start up a motor generator and feed back into the line and energize the dead phases?

8. Would grounds on both sides of the station on all phases provide maximum protection?

9. Would opening the cutouts on the east pole provide as good protection from that side as protective grounds?

10. Can you depend that a conductor is grounded if you cannot see protective grounds both ways in sight?

11. In planning a job should maximum safety be provided for the workmen? Argue these discussion points out in your next safety meeting. By doing so, you can formulate safer work practices and prevent a similar accident on your system. We are sure that the manager who took the time to give us these details and sketch will feel that his time was well spent.